



**Npuls**  
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# Smarter education with AI

**A guide for teachers  
and other educational  
professionals**

**Moving  
education.**

# Clair, a conversational agent for collaborative learning



## ▶▶ Inspiring example

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### The Collaborative Learning Agent for Interactive Reasoning

The Collaborative Learning Agent for Interactive Reasoning ('Clair') is a conversational agent that aims to support students in small group discussions in science learning to be more productive. Clair was developed at the University of Twente to address some limitations that similar technologies have. Our first prototype has been tested in secondary classrooms in Brazil and the Netherlands. Among the main challenges for designing collaborative conversational agents are "what to say?" and "when to say it?". To address what, Clair has a set of "talk moves" or questions to ask to students. These talk moves are derived from a classroom talk framework called Academically Productive Talk (APT). To decide when, we designed fuzzy logic-based triggers for each of these talk moves. These triggers are designed to be interpreted and configured by humans while still relying on patterns from data.

### A chatbot for enhancing the quality of students' discussions

As students are working together online in small groups and using chat discussions to understand these concepts, having a productive discussion is critical. Teachers can assist students by asking questions to make them deepen their reasoning or clarify the ideas at hand. This is usually very time consuming for teachers, and in some cases, they do not guide student chats at all. In addition, the quality of discussions can greatly vary, from engaging and productive to distracting and unproductive. For example, a more verbal student will contribute more while the partner just agrees, or another student may barely build on the partner's contributions. Conversational agents for collaborative learning are seen as a promising approach to scale productive talk support among student groups, particularly in cases where a teacher cannot be present.



### The importance of conversational agents

From this project, we have learned that recent advancements in machine learning can support the design of conversational agents that can work across various science topics and languages while also providing flexible triggers for a range of talk moves. By having a conversational agent that is reliable across multiple contexts, educational researchers can further study how to dynamically provide productive talk supports to student groups, teachers can have more flexibility with online classroom orchestration, and students can reflect on their discussion and internalize practices of productive talk into their lives.

### Want to know more?

de Araujo, A., Papadopoulos, P., McKenney, S., & de Jong, T. (2023). Supporting Collaborative Online Science Education with a Transferable and Configurable Conversational Agent. CSCL 2023 Conference Proceedings.

de Araujo, A., Papadopoulos, P., McKenney, S., & de Jong, T. (2023). Automated coding of student chats, a trans-topic and language approach. *Computers & Education: Artificial Intelligence*, 4, 100118.

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